

## GEOLOGIC MAPPING IN GANIKI PLANITIA (V-13), VENUS

M.A. Ivanov<sup>1,2</sup> and J.W. Head<sup>2</sup>

<sup>1</sup>Vernadsky Institute, Academy of Sciences, Moscow, Russia; <sup>2</sup>Brown University, Providence, RI

We have undertaken mapping of the territory of Ganiki Planitia quadrangle (V-13). The map area covers a significant portion of a large basin. This is a feature from the family of regional equidimensional basins on Venus, two of which--Lavinia and Atalanta Planitiae--we have already mapped. Our goals at this step of the mapping were to (1) develop a sense of the general geologic themes of the area under study, (2) see if the stratigraphic scheme we developed and used during the mapping of two remote quadrangles, V-55 (Lavinia Planitia) and V-4 (Atalanta Planitia) is applicable to an additional area of large basins on Venus, and (3) establish the main relations of units and structures in the area of V-13 quadrangle.

**Main geologic features of the area:** The V-13 quadrangle covers the area from 25° to 50° N. and from 150° to 180° E. and spreads from the southern margins of Atalanta Planitia to Niobe Planitia (southwest part of the area) and Nokomis Montes (southeast part of the area). The majority of the quadrangle is characterized by vast regional plains the surface of which is deformed by numerous wrinkle ridges. In places, wrinkle ridges are collected into broad zones that are preferentially oriented east-west in the south of the quadrangle and in a northeast direction in its northern portion. Fragments of ridge belts are seen through the whole area of V-13. The belts make up local ridges that separate the surface of the regional basin into relatively small (a few hundreds of kilometers across) second-order basins. The belts are oriented preferentially in a north-northeast direction in the western part of the area and in a north-northwest direction in the eastern part of the quadrangle. There are no coronae within the quadrangle. Several small coronae (within the territory of V-4 quadrangle) are at the southern edge

of Atalanta Planitia, in the transition zone between Atalanta and Ganiki Planitiae. There is one large volcanic structure in the northern part of V-13 quadrangle. The structure is also in the transition zone between the Atalanta and Ganiki basins. The most unusual feature of the V-13 quadrangle is the narrow curvilinear channel, Baltis Vallis, which runs through the whole area from north to south. At the regional scale, the channel is broadly curved around high-standing Nokomis Montes, and the channel is apparently deflected by the local heights such as fragments of ridge belts.

**Stratigraphic units in the V-13 area:** The surface in the V-13 area is composed of several units that appear similar to those mapped elsewhere [1-9]. The units are as follow (from oldest to youngest).

*Tessera terrain* (unit t) is represented by tectonically deformed materials and occurs as slightly elongated massifs from a few tens up to a few hundreds of kilometers. The surface of the unit bears several sets of intersecting tectonic features of contractional and extensional origin. The main occurrence of tessera within V-13 is in the Nokomis Montes area where elongated tessera patches are sub-parallel and oriented roughly in a west-northwest direction.

*Densely fractured plains* (unit pdf) surfaces are heavily dissected by numerous densely packed narrow sub-parallel lineaments a few tens of kilometers long and a few hundred meters (and down to the resolution limit) wide. The plains usually form small (tens of kilometers across) equidimensional, elongated, and arc-like occurrences slightly elevated relative to their surroundings. Within the quadrangle, unit pdf is in close spatial

association with tessera and occurs predominantly in the Nokomis Montes area. Where units t and pdf are in contact there is evidence for the embayment of tessera by unit pdf.

*Fractured and ridged plains* (unit pfr) and *ridge belts* (br) are materials having the morphology of lava plains occasionally deformed by broad ridges. The ridges are up to 10-15 km wide and up to several tens of kilometers long. Where not ridged, unit pfr has a gently rolling and morphologically smooth surface. Ridges of the belts gradually merge with the less deformed unit pfr, suggesting that the belts are tectonic facies of the same material unit. The radar backscatter cross-section of unit pfr is higher than that of regional plains and typically lower than that of tessera and unit pdf. Where units pfr and pdf are in contact, there is evidence that the material of unit pfr embays outcrops of unit pdf. Ridge belts are more widely distributed and make up local ridges throughout the quadrangle.

*Shield plains* (unit psh) are characterized by the presence of numerous small (from a few up to 10 km across) shield-like features, interpreted as volcanic edifices. Shield plains typically occur as small equidimensional areas several tens of kilometers across. Material of the plains embays older units and there is evidence for the embayment of unit psh by material of the regional plains.

*Plains with wrinkle ridges, lower member* (unit pwr<sub>1</sub>) are characterized by morphologically smooth surfaces moderately deformed by numerous wrinkle ridges. The surface of the plains usually has uniform and relatively low radar backscatter cross section. The homogeneous albedo pattern of unit pwr<sub>1</sub> without visible flow-

like features precludes identification of the sources of the unit material. The unit makes up the majority of the surface within the quadrangle (about 70-75%).

*Plains with wrinkle ridges, upper member* (unit pwr<sub>2</sub>) are characterized by morphologically smooth surfaces moderately deformed by wrinkle ridges with a distinctly higher albedo than unit pwr<sub>1</sub>.

The above stratigraphic column, which is applicable to the area of V-13 quadrangle, is generally similar to those for the Lavinia and Atalanta basins. However, the set of units that composes the surface of Ganiki Planitia appears incomplete. For instance, there is no evidence for the presence of fracture belts (FB), which are widespread throughout the territory of Lavinia and concentrated along the margins of Atalanta. Also, within V-13 quadrangle there are apparently no occurrences of the youngest units, smooth plains (unit ps) and lobate plains (unit pl), which are typical of the edges of the Lavinia and Atalanta basins. Tentatively, we may conclude that the above three basins are characterized by a broadly similar geologic history which, however, is different in details. More detailed mapping of V-13 will further document the differences in the evolution of the basins.

**References:** [1] Head J.W. and Ivanov M.A. *LPSC XXVII (Abstr.)*, 515, 1996; [2] Aubele J.C. *LPSC XXV (Abstr.)*, 45, 1994; [3] Basilevsky A.T. and Head J.W. *EMP*, 66, 285, 1995; [4] Rosenberg L. *LPSC XXVI (Abstr.)*, 1185, 1995; [5] Tanaka K.L. et al., in: *Venus II*, S.W.Bougher et al., eds., Univ. Arizona Press Tucson, p. 667, 1997; [6] Basilevsky A.T. and Head J.W. *JGR*, 103, 8531, 1998; [7] DeShon H.R. and Hansen V.L. *LPSC XXIX #1438*, 1998; [8] Dohm J.M. and Tanaka K.L. *LPSC XXIX #1920*, 1998; [9] Ivanov M.A. and Head J.W. *LPSC XXIX #1261*, 1998.